

REMARKS

A. Introductory Remarks

Reconsideration and allowance of this application is requested. No claims have been amended. The rejections in the final Office Action are addressed below.

B. Rejection of Claims 1-3 and 9 Under 35 U.S.C. §103(a)

Claims 1-3 and 9 have been rejected as obvious under 35 U.S.C. §103 (a) over U.S. Pub. No. 2001/0018270 ("Tsuchiya") in view of U.S. Patent No. 6,110,830 ("Skrovan"). Applicants traverse this rejection at least for the reasons below.

As acknowledged by the Examiner, Tsuchiya fails to teach or suggest any concentration of aqueous ozone in his polishing slurry. Tsuchiya also fails to teach or suggest specifically using a concentration of aqueous ozone between 1 to about 20 ppm in aqueous solution. *See* Office Action at p. 3. The Office Action, however, states that Skrovan discloses various concentrations of ozone in the polishing composition (10-20 ppm, or less than 0.01% by atomic percent, and 5-50% of ozone)¹ which is less than that at which ozone interactions occur. *Id.*

Contrary to the assertion in the Office Action, Applicants submit that the cited concentration ranges of aqueous ozone in Skrovan are for two different solutions; one of which (10-20 ppm) is a de-ionized (DI) water rinse and the other of which (5-50% ozone by atomic weight) is the concentration of ozone in Skrovan's polishing composition to form an oxide layer over the substrate. *See* Skrovan, abstract; col. 1, lines 64-67.

Applicants acknowledge that Skrovan teaches that DI (de-ionized) water can comprise a small amount (10 to 20 ppm, or less than 0.01% by atomic percent) of ozone due to atmospheric ozone diffusing into the water.² *See*, Skrovan col. 1, ll. 64-67. Based upon published data

¹ Applicants again note that the final Office Action states that Skrovan discloses "1-20 ppm". However, this appears to be a typographical error in that the "1" should be "10". *See*, Skrovan col. 1, lines 64-66. Please correct.

² The EPA (Environmental Protection Agency) literature (*available at*: <http://www.epa.gov/air/airtrends/weather.html>) shows that the ground level ozone concentration in air is about **55 parts per billion (ppb)**. Given such a low concentration of ozone in the atmosphere at ground level, the resulting concentration in DI water would be in the range of parts per billion (ppb) based on Henry's law, which is $P_{\text{gas}} = kC$ where p is the partial pressure of the gas, C is the concentration of gas in the solution and K is the Henry's Law constant. Also, based on Henry's law, in order to obtain a dissolved ozone concentration range of 10-20 ppm in DI water as asserted by Skrovan, the partial pressure of ozone (P_{ozone}) in the atmosphere would have to be in the range

available from the Environmental Protection Agency (EPA), Applicants respectfully disagree with Skrovan that normal DI water can contain such a high concentration range of ozone, *i.e.*, 10-20 ppm (which would be poisonous to humans and other life forms). Rather, unless artificially enriched, normal DI water at sea level contains dissolved ozone in the range of less than 1 parts per billion (ppb). Therefore, Skrovan is off by a factor of at least 1000 in his assertion of an aqueous ozone concentration in DI water. *See* also footnote 2.

Even if Skrovan's erroneous teaching (that DI water contains such a very high concentration of dissolved ozone) is relied upon, Applicants submit that Skrovan teaches using this DI water strictly as a rinse solution to flush the polishing pad and the substrate layer after polishing of the aluminum-comprising layer. *See*, Skrovan col. 1, ll. 57-62 and abstract. Moreover, Skrovan teaches that the DI water containing dissolved ozone (which, as discussed in footnote 2, is likely actually present in an amount less than 1 part per billion) does not comprise a grit (*i.e.*, abrasive particles) so as to minimize and reduce abrasion of the aluminum-comprising layer as the DI water displaces the slurry. *See*, Skrovan col. 1, ll. 62-65. Accordingly, one of skill in the art would not confuse this DI water rinse to remove the abrasive particles for an actual CMP composition or be motivated to utilize the minimal ozone concentration of the DI water rinse in a CMP composition.

Regarding the concentration of ozone in a polishing composition, Skrovan teaches using significantly higher concentrations, namely at least about 5% by atomic percent, (*i.e.*, 50,000 ppm) of aqueous ozone. *See* Skrovan col. 2 ll. 65-67; col. 3 ll. 3-7; col. 4 ll. 6-17. Thus, Skrovan suggests using concentrations of ozone that are orders of magnitude greater than those recited in claim 1 in a CMP slurry and, therefore, teaches away from using relatively low concentrations of aqueous ozone, such as those recited in claim 1, in a CMP composition. Accordingly, one of skill in the art would actually be motivated to use significantly higher concentrations, at least 5% by atomic weight (*i.e.*, 50,000 ppm) of aqueous ozone in a CMP composition based upon the teaching of Skrovan. Accordingly, use of a concentration of ozone

of approximately 33,000 ppm to 66,000 ppm. Thus, Applicants contend that unless ozone were being intentionally added (artificially enriched) to Skrovan's DI water rinse solution, it is impossible that DI water alone would contain such a high level of ozone (10-20 ppm), which would be poisonous to living beings on this planet. Accordingly, Applicants submit that Skrovan does not teach one of skill in the art how to achieve a concentration of 10-20 ppm of ozone in DI water, as this concentration is far greater than what would otherwise be achieved simply by diffusion of ozone from the atmosphere.

of between 1 to about 20 parts per million as recited in Applicants' claim 1 would not be obvious based upon the teaching of Tsuchiya modified by Skrovan. Applicants therefore respectfully request withdrawal of the rejection of claim 1, including the rejections of claims 2, 3, and 9 that depend therefrom.³

C. The Rejection of Claim 8 Under 35 U.S.C. §103 (a)

Claim 8 has been rejected as obvious under 35 U.S.C. §103 (a) over Tsuchiya in view of Skrovan as applied to claim 1 above and further in view of U.S. Patent No. 5,738,800 ("Hosali"). Applicants traverse this rejection.

Claim 8 depends from independent claim 1. As discussed above, Tsuchiya and Skrovan, either alone or in combination, fail to anticipate or render obvious the elements of claim 1. Hosali fails to provide any teaching regarding the use of ozone or a particular ozone concentration in a polishing composition, and therefore, cannot be deemed, alone or in combination with Tsuchiya or Skrovan or both, to render claim 1 obvious. On this basis and because claim 8 depends from claim 1, Applicants respectfully request the withdrawal of this rejection.

D. The Rejection of Claim 5 Under 35 U.S.C. §103 (a)

Claim 5 is rejected as obvious under 35 U.S.C. §103 (a) over Tsuchiya in view of Skrovan and further in view U.S. Patent No. 6,124,210 ("Chino"). Although claim 5 has been canceled, thereby mooting this rejection, Applicants will address Chino relative to claim 1. As an initial matter, however, the rejection of claim 5 and the characterization of Chino in the Office Action will be addressed.

In the previous Office Action dated January 22, 2007, the rejection of claim 5 was based only upon the combination of Tsuchiya and Chino. Applicants' response to that rejection stated that Chino failed to teach the recited concentration of ozone. In response to that argument, the current final Office Action states that Applicants' argument is not convincing because Skrovan teaches the recited concentration. Office Action, pp. 4-5. Since Skrovan was not cited in the prior rejection and is now relied upon as teaching the recited concentration, it appears that

³ Applicants direct the Examiner's attention to Section D and the rejection of claim 5 for a discussion of the reference cited in that rejection relative to claim 1.

Tsuchiya in combination with Chino only did not render the recited concentration in claim 5 obvious. Accordingly, the current rejection of claim 5 is now based upon the combination of all three of these references.

Interestingly, despite the Applicants' argument in the prior response, the final rejection still appears to rely without reservation upon Chino as the basis for making the recited ozone concentration obvious by stating that "it would have been obvious to select an ozone concentration in the cleaning process of Tsuchiya because Chino teaches that in the ozone treatment process, the number of the circular defects is reduced as the progress of the process time at a given ozone concentration," *see*, Office Action, pp. 4-5. Nonetheless, Applicants will address this rejection as it applies to amended claim 1 based upon the combination of all three references. To the extent that the Office Action is simply asserting that Chino would make it obvious to use *any* or *some* given concentration of ozone in Tsuchiya, such is clearly insufficient as teaching the specifically recited ozone concentration of claim 1 as previously amended herein.

As discussed above in connection with claim 1, neither Tsuchiya, alone or in combination with Skrovan, render obvious a chemical mechanical polishing (CMP) composition having between 1 to about 20 parts per million (ppm) of ozone as recited in previously amended claim 1. For the same reasons as submitted by Applicants in their previous response, Chino, alone or in combination with either or both of Tsuchiya or Skrovan, fails to provide any further information that can be used to conclude that this feature is obvious.

Chino is directed to a substrate surface cleaning method wherein a pre-process gas containing a very high concentration of ozone (100 g/Nm^3) is directed to a substrate surface to oxidize particles on the surface. *See* Chino Abstract. Chino teaches that the "Occurrence of Circular Defect" of the silicon containing film is a function of the duration of the " O_3 process" at a fixed gaseous ozone concentration of 100 g/Nm^3 . *See* Chino col. 7, table 3. In other words, Chino teaches the application of gas containing ozone directly onto the substrate. Chino does not teach the dissolution of ozone into an aqueous chemical mechanical polishing composition. Therefore, even taken in combination with Tsuchiya and Skrovan, Chino fails to provide any additional teaching that would render the features of claim 1 obvious, in particular, the recitation of between 1 to about 20 parts per million (ppm) of ozone in the polishing composition. Moreover, there is no teaching in Chino that the use of a gas phase concentration of $100 \text{ (g/Nm}^3\text{)}$

ozone would provide between 1 to about 20 parts per million of ozone in a polishing composition, even if one skilled in the art were to conclude that Chino teaches the application of a gas containing ozone to a chemical mechanical polishing composition.

Accordingly, the combination of Tsuchiya, Skrovan, and Chino fails to render obvious aqueous ozone concentrations wherein a concentration of ozone in said aqueous solution is between 1 to about 20 parts per million as recited in Applicants' previously amended claim 1. Therefore, Applicants submit that amended claim 1, and all claims dependent therefrom, are allowable in light of these references.

E. The Rejection of Claims 6-7 Under 35 U.S.C. §103 (a)

Claims 6-7 have been rejected as obvious under 35 U.S.C. §103 (a) over Tsuchiya in view of Skrovan and further in view of U.S. Patent No. 6,429,133 ("Chopra"). Applicants traverse this rejection.

Claims 6 and 7 depend from independent claim 1. As discussed above, Tsuchiya and Skrovan fail to teach or suggest each and every feature of previously amended claim 1. Similarly, Chopra fails to teach or suggest, alone or in combination with Tsuchiya or Skrovan or both, a concentration of ozone in an aqueous solution that is between 1 to about 20 parts per million. Therefore, Tsuchiya, Skrovan, and Chopra do not teach or suggest, alone or in combination, all of the elements of claim 1. Accordingly, on this basis alone, Applicants request withdrawal of this rejection of dependent claims 6 and 7.

F. Claim 10

Applicants submit that the Office Action has not addressed the merits of claim 10 that was added in the previous response filed on August 2, 2007. This claim is specifically directed specifically to spinel as the abrasive particles. Applicants note that neither Tsuchiya nor Skrovan teach the use of spinel as the abrasive particle, and, therefore, this claim should be allowable.

G. Request for Allowance

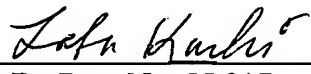
In view of the arguments presented above, all pending claims are now thought to be in condition for allowance, an indication of which is solicited. In the event that any issues remain outstanding, Applicants would appreciate the courtesy of a telephone call to the undersigned

counsel to resolve such issues in an expeditious manner so as to place this application in condition for allowance.

No additional fees are believed due. However, if any additional fees are determined to be due, the Commissioner is hereby authorized to charge these fees to the Morgan, Lewis & Bockius deposit account no. 50-0310.

Respectfully submitted,

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